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Pesticide Fact Sheet Number 213: Sulfosate

(U.S.) Environmental Protection Agency, Washington, DC

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NTIS

United States
Environmental Protection
Agency

Office of Pesticides
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EPA

Pesticide Fact Sheet

Name of Chemical: Sulfosate

Reason for Issuance: New Chemical Registration

Date Issued: JAN 9 1990

Fact Sheet Number: 213

1. Description of Chemical

Common Name: Sulfosate

Chemical Name: N-phosphonomethylglycine trimethylsulfonium salt

Code Name: SC-0224

Trade Name: Touchdown

OPP (Shaughnessy) Number: 128501

Chemical Abstracts Service (CAS) Number: 81591-81-3

Year of Initial Registration: 1989

Pesticide Type: Herbicide

U.S. and Foreign Producers: ICI Americas Inc.

2. Use Patterns and Formulations

Applications Sites: Noncrop areas around the farm such as: farmyards, fuel storage areas, fence rows, rights-of-way, soil bank land, and barrier strips

Types and Methods of Application: Application is by spray, wiper or hand-directed spot applications to the foliage of actively growing weeds. Aerial application is prohibited.

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U.S. Environmental Protection Agency
Office of Pesticide Programs
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13. Type of Report & Period Covered

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, science findings.

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement: Publicly Available

19. Security Class (This Report) Unclassified | 21. No. of Pages 9

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(See ANSI-Z39.18) See Instructions on Reverse

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

Pests Controlled: Broadleaf and grass weeds

Application Rates: Application rates range from a 1% solution up to 4.12 pounds active ingredient (ai)/A, depending on target weed and type of application.

Types of Formulations: 39.9% ai (4 lbs ai/gal) and 52.2% ai (5.5 lbs ai/gal) liquid concentrate

Usual Carriers: Water and surfactant

3. Science Findings

Summary Science Statement:

Ample toxicological, environmental fate, ecological effects and product chemistry data have been submitted to support the non-crop use of sulfosate. Based on acute toxicity studies, sulfosate is classified as Toxicity Category III, signal word CAUTION. Sulfosate is not developmentally toxic and was non-mutagenic in the Ames assay. The chemical is practically nontoxic to fish but slightly toxic to aquatic invertebrates. Sulfosate is practically nontoxic to birds based on dietary studies, but is slightly toxic to birds on an acute oral basis (mallard duck). The chemical is essentially nontoxic to honey bees. Sulfosate is stable to hydrolysis and aqueous photolysis. Sulfosate degrades reasonably fast in soil under both aerobic and anaerobic conditions. The chemical is not likely to leach and contaminate groundwater under actual use conditions.

Chemical Characteristics:

Physical state: liquid

Color: brownish-amber

Odor: Faint, sulfur odor

Boiling point: 109° C

Density: 1.27 g/cc

Vapor pressure:

7.2 mm Hg at 10° C
13.3 mm Hg at 20° C
23.6 mm Hg at 30° C

Vapor pressure of the active ingredient in aqueous solution: 3×10^{-7} mm Hg at 25° C

pH: 5.2 - 5.6 (neat), 3.9 - 4.3 (dilute)

Viscosity: 38.2 centistokes at 25° C

Molar water solubility (pure active ingredient): 17.6 X 10^6 g

Octanol/water partition coefficient (K_{ow}): less than 10, no sulfosate [<0.1 part per million (ppm)] in the octanol phase

Stability: No apparent degradation, even at elevated temperatures (52° C) or periods of up to 12 weeks.

Unusual handling characteristics: Do not mix or store sulfosate in galvanized steel or unlined steel containers.

Toxicology Characteristics:

Acute Toxicity (Technical)

Acute oral toxicity (rat): 748 mg/kg (males), 755 mg/kg (females), Toxicity Category III, (62% ai)

Acute dermal toxicity (rabbit): greater than 2,000 mg/kg, Toxicity Category III, (62% ai)

Primary skin irritation (rabbit): a mild dermal irritant, Toxicity Category IV, (62% ai)

Primary eye irritation (rabbit): mild irritation to conjunctivae, irritation is reduced by washing, Toxicity Category III, (62% ai)

Acute inhalation toxicity (rat): greater than 0.81 mg/L for a 4-hour exposure, Toxicity Category III, (56.2% ai)

Dermal sensitization (guinea pig): results indicate that sulfosate is a mild sensitizer, (56.3% ai)

Acute Toxicity (Touchdown 4-LC, 39.9% ai)

Acute oral toxicity (rat): 1,760 mg/kg (males), 1,298 mg/kg (females), Toxicity Category III

Acute dermal toxicity (rabbit): greater than 2,000 mg/kg (males/females), Toxicity Category III

Dermal irritation (rabbit): a non-irritant in intact skin of rabbits after 4 hours of exposure, Toxicity Category IV

Eye irritation (rabbit): a moderate irritant, clearing by day 7, Toxicity Category III

Dermal sensitization (guinea pig): not a dermal sensitizer

Subchronic Toxicity

A 21-day dermal study in rabbits was conducted using dose levels of 0, 10, 100 and 1,000 mg/kg/day. A slight dermal irritation was observed in males and females at all dose levels. However, this finding did not compromise the results of the study. The no-observable-effect-level (NOEL) is greater than or equal to 1,000 mg/kg/day for systemic toxicity (highest dose tested [HDT]).

Teratology

A teratology study in rabbits was conducted with dose levels of 0, 10, 40 and 100 mg/kg/day. A NOEL for maternal toxicity was not determined. The lowest-observed-effect-level (LOEL) for maternal toxicity was 10 mg/kg/day. A NOEL based on increased maternal mortality and spontaneous abortion was 40 mg/kg/day.

Teratogenicity was not observed in a rat teratology study using dose levels of 0, 30, 100 and 333 mg/kg/day. Maternal toxicity, seen as reduced body weights and feed was demonstrated in the high dose group (333 mg/kg). Fetotoxicity, as evident by reduced fetal body weight in the high dose group, apparently resulted from maternal toxicity.

Mutagenicity

Sulfosate was non-mutagenic in the Ames assay, at the concentrations tested, 2.5 through 40 ul/plate.

Sulfosate was mutagenic in the mouse lymphoma mutation assay under normal test conditions and at the concentrations tested, 3.0-5.0 ul/ml with metabolic activation and 3.5-5.0 ul/ml without metabolic activation.

Results from cytogenic assays (chromosomal aberration and sister chromatid exchange) indicate that sulfosate was not a clastogenic agent and did not induce any increase of mutant frequency in the cultured L5178Y mouse lymphoma cell system, with and without metabolic activation (under the pH-adjusted test conditions [pH 7.4] and at the concentrations tested, 4-10 ul/ml). Sulfosate was not a clastogenic agent in the cultured CHO (Chinese Hamster Ovary Cell) system with and without metabolic activation at the concentrations tested, 4-10 ul/ml.

Major routes of exposure: Mixers, loaders and applicators would receive the most exposure via skin/eye contact and inhalation.

Physiological and Biochemical Behavioral Characteristics

Foliar absorption: Sulfosate is absorbed in the foliage

Mechanism of pesticide action: systemic

Environmental Characteristics:

Hydrolysis: Sulfosate does not hydrolyze at pH 5 - 9.

Aqueous photolysis: The anion portion of sulfosate, N-phosphonomethylglycine (PMG), has half-lives of 14.6, 77.9 and 41.6 days at pH 5, 7 and 9, respectively. Photoproducts were phosphoric acid and aminomethylphosphonic acid. The trimethylsulfonium (TMS) cation was stable at pH 5 and 7, but degraded with a half-life of 31.7 days at pH 9.

Aerobic soil metabolism: The TMS moiety of sulfosate has a half-life of 2-3 weeks. The major degradate is CO_2. The PMG moiety of sulfosate has a half-life of 2-3 days. The major degradate is aminomethylphosphonate (AMP).

Leaching, adsorption/desorption: Sulfosate exhibits low mobility in soil. The PMG moiety and its degradate, AMP, are immobile. The TMS moiety has moderate mobility in soil.

Field dissipation: Field dissipation studies conducted in Virginia, Florida, California, Iowa and Mississippi indicate that the PMG moiety and its degradate AMP have a low leaching potential. The TMS moiety has a moderate leaching potential.

Fish accumulation: This data requirement has been waived, based on sulfosate's high water solubility and low octanol/water partition coefficient, K_{ow}.

Potential to contaminate groundwater: TMS has a moderate propensity for leaching but degrades reasonably fast to CO_2 in soil under both aerobic (half-life of 2 months) and anaerobic (half-life of 2-3 weeks) conditions. Therefore, TMS residues are not likely to leach and contaminate groundwater under actual use conditions. Available data indicate that PMG has low leaching potential.

Ecological Characteristics:

Technical Sulfosate (58.5% ai)

Avian acute oral toxicity:

Mallard duck	950 mg/kg

Avian dietary toxicity:

Mallard duck	greater than 5,000 ppm
Bobwhite quail	greater than 5,000 ppm

Fish acute toxicity:

Rainbow trout	1,800 mg/L
Bluegill sunfish	3,500 mg/L

Aquatic invertebrate toxicity:

Daphnia magna	71 mg/L

Sulfosate 4-LC (39.9% ai)

Fish acute toxicity:

Rainbow trout	603 mg/L
Bluegill sunfish	297 mg/L

Acute toxicity to honey bees: 62.1 micrograms per bee

The above studies indicate that sulfosate is practically nontoxic to birds on a dietary basis, slightly toxic to Mallard ducks on an acute oral basis and slightly toxic to D. magna. Sulfosate is practically non-toxic to fish. The 4-LC formulation is considered to be practically non-toxic to fish, and essentially nontoxic to honey bees.

A rainbow trout early life stage and D. magna life cycle test were conducted using sulfosate 4-LC. Both studies are classified Core.

Potential problems related to endangered species: No endangered species review is needed for this product at this time because of its substantial similarity to glyphosate which is registered for numerous uses. The Agency will consult with the U. S. Fish and Wildlife Service to discuss if any species would be in jeopardy under other registrations for sulfosate. This review will be conducted under the new endangered species approach (species-based) after implementation of the program.

4. Summary of Regulatory Position and Rationale

The available data provide sufficient information to support the conditional registration of Touchdown 4LC and unconditional registration of Touchdown Concentrate on noncrop areas around the farm.

Use, formulation, manufacturing process or geographical restrictions: Aerial application is prohibited on the label.

5. Summary of Major Data Gaps

Acute Inhalation Study (4-LC formulation)

21-Day Dermal Study (4-LC formulation)

6. CONTACT PERSON AT EPA

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DISCLAIMER: The information in this Pesticide Fact Sheet is a summary only and is not to be used to satisfy data requirements for pesticide registration and reregistration. The complete Registration Standard for the pesticide may be obtained from the contact person listed above.